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As 'Yuck Factor' Subsides, Treated Wastewater Flows From Taps

By FELICITY BARRINGER

SAN DIEGO — Almost hidden in the northern hills, the pilot water treatment plant here does not seem a harbinger of revolution. It cost $13 million, uses long-established technologies and produces a million gallons a day.

But the plant's very existence is a triumph over one of the most stubborn problems facing the nation's water managers: if they make clean drinking water from wastewater, will the yuck factor keep people from accepting it?

With climate change threatening to diminish water supplies in the fast-growing Southwest, more cities are considering the potential of reclaimed water. A new report from the National Academy of Sciences said that if coastal communities used advanced treatment procedures on the effluent that is now sent out to sea, it could increase the amount of municipal water available by as much as 27 percent.

San Diego's success, 12 years after its City Council recoiled from the toilet-to-tap concept, offers a blueprint for other districts considering wastewater reuse.

For most of the four decades beginning in 1970, the arid West was the fastest-growing region in the country; the population of Nevada quintupled in that period while Arizona's nearly quadrupled. Continued population growth, unmatched by growth in water storage capacity, makes this a "new era in water management in the United States," the science group's report said.

"The pressures on water supplies are changing virtually every aspect of municipal, industrial, and agricultural water practice," it said.

Back in 1998, a branch of the National Academy of Sciences, the National Research Council, issued a study finding that supplementing stream flows or reservoirs with this water, a process called indirect potable reuse, was acceptable, although only as a last resort. Now, acceptance of reclaimed water for drinking is spreading, if slowly.

Funneling reclaimed water into water supplies is being considered in a variety of communities like Miami and Denver (which has experimented with the technology), as well as in drought-ravaged

municipalities in Texas like Big Spring. The tiny mountain resort town of Cloudcroft, N.M., mingles reclaimed water with local well water. In Northern Virginia, reclaimed water has flowed into the Occoquan Reservoir for three decades.

Still, just one-tenth of 1 percent of municipal wastewater nationally was recycled into local supplies in 2010. Only a handful of systems replenish their reservoirs or groundwater basins with treated wastewater.

The largest is in Orange County, Calif., about 100 miles north of San Diego, where a four-year-old system replenishes the groundwater basin with 70 million gallons of treated effluent daily — about 20 percent of the content of the aquifer. Other sites include El Paso and some areas around Los Angeles.

Edmund Archuleta, the president of El Paso Water Utilities, said in an interview that his city recycled all of its wastewater. Most is used for things like cooling industrial plants or watering playing fields, he said, but “it’s been accepted that we’re recharging some of that water into the aquifer” and into the Rio Grande.

Globally, the largest population center to adopt the technology is Singapore, home to five million people. Officials say about 15 percent of its water originates from treated effluent, marketed as “NEWater.” Most is used for irrigation or manufacturing; some for drinking.

The original technology for recycling wastewater was developed in the 1950s — involving chemical disinfection, carbon-filtration treatment or both — and is in use on the International Space Station. The bulk of recycled water is used on lawns or golf courses, in factories or as an underground barrier against seawater intrusion.

The newest iteration, in use in Orange County, is a three-step process involving fewer chemicals and more filtering.

First, wastewater is filtered through string-like microfibers with holes smaller than bacteria and protozoa. Then it goes through reverse osmosis, an energy-intensive process forcing the water through plastic membranes that remove most molecules that are not water. Finally, it is dosed with hydrogen peroxide and exposed to ultraviolet light, a double-disinfectant process. The result is roughly equivalent to distilled water, Orange County officials say.

After touring the $481 million plant in Orange County, visitors are offered a glass of the water. Is it safe? The new National Academy analysis suggests that the risk from potable reuse “does not appear to be any higher, and may be orders of magnitude lower” than any risk from conventional treatment. There are currently no national standards for water reuse processes, only for drinking-water quality.

Of course, the treatment process is much more expensive than tapping local groundwater — in Southern California, about 60 percent more, and in El Paso about four times more. But to remain sustainable, groundwater must be used sparingly. Orange County's reclaimed water costs $1.80 per thousand gallons when regional water subsidies are factored in. This is similar to what it pays to import either Colorado River water or water from Northern California. Without the benefit of subsidies, reclaimed water's cost was just 14 percent less than desalinated water's, which experts say requires 3 to 10 times the energy output.

The bigger hurdle to public acceptance may be psychological. Carol Nemeroff, a psychologist at the University of Southern Maine, said the notion of treated sewage "hooks into the intuitive concept of contagion" and contamination. To overcome this, she said, a city must "unhook the current water from its history." That proved to be the case in 1998 in San Diego when the water department's initiative was derided as "toilet to tap" during a bruising City Council campaign. Council members refused to allow further discussion of it.

A 2004 poll commissioned by the San Diego County Water Authority found that 63 percent of respondents opposed reuse. Then the water department began reaching out to customers with discussion groups and public meetings. Members of the Surfrider Foundation, an environmental group, reminded residents that almost every municipal wastewater plant practices water reuse anyway, since discharged treated wastewater is reused downstream.

"It isn't toilet to tap. It's toilet to treatment to treatment to treatment to tap," said Belinda Smith, a Surfrider volunteer.

Water shortages and rationing, however, did the most to change attitudes. San Diego's annual rainfall meets about 15 percent of its needs, and the city's water managers grew worried that as California reeled from droughts, they could have trouble importing water.

In 2009, the third year of a severe drought, Mayor Jerry Sanders met with biotechnology industry executives who told him that water shortages posed a threat to their businesses. "They were talking about moving away from San Diego," he said.

So the mayor quietly switched sides, and the City Council fell into line. "If science is behind you and you can prove that, I think people are willing to listen," Mr. Sanders said in an interview. "The public is worried about scarcity."

Marsi Steirer, the deputy director of San Diego's public utility agency, said it now estimated that by 2020 or so, recycled wastewater could account for 7 percent of the total in the city's main reservoir.

Some people are still put off. Virginia Soderberg, 91, president of the Convair Garden Club in San Diego, called reclaimed water "the end of the world. I wouldn't even want my cat to drink it."

But a 2011 poll by the utility showed that local opposition to reuse had dropped to 25 percent.

The change of heart found voice on the editorial page of The San Diego Union-Tribune, a onetime opponent, in an editorial titled “The Yuck Factor: Get Over It.”

That sentiment was echoed in a cartoon on a California public radio blog depicting a dog with its nose in a toilet.

The caption? “Ten million dogs can’t be wrong.”